

## U.S. Patent Application Serial No. 10/781,897

WHAT IS CLAIMED IS:

1. (Original) A method for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the method comprising:
  - performing a first multi-objective optimization process, based on competing objectives, to generate an efficient frontier of possible solutions;
  - observing the generated efficient frontier;
  - based on the observing, identifying an area of the efficient frontier in which there is a gap;
  - effecting a gap filling process by which the efficient frontier is supplemented in the area of the gap, the efficient frontier being used in investment decisioning.
2. (Original) The method of claim 1, wherein the efficient frontier is presented to a human observer in the form of a graphical representation.
3. (Original) The method of claim 1, wherein the efficient frontier is presented to a computer processor in the form of data.
4. (Original) The method of claim 1, wherein the gap filling process is performed using a Target Objectives Genetic Algorithm (TOGA) process.
5. (Currently amended) The method of claim 1, ~~wherein further~~ including the selecting at least one portfolio from the generated efficient frontier ~~includes:~~  
~~by selecting the~~ at least one portfolio in the area that was filled in by the gap filling process.

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6. (Original) The method of claim 1, the effecting the gap filling process by which the efficient frontier is filled in the area of the gap further including:
- providing a set of target vectors;
- generating a series of chromosomes, evaluated on the basis of the target vectors, over multiple generations.
7. (Original) The method of claim 6, wherein the method further includes evaluating the fitness of each chromosome until a population with an acceptable fitness is determined so as to fill in the identified gap.
8. (Original) The method of claim 6, wherein the method further includes placing targets in the areas of the gaps.
9. (Original) The method of claim 6, wherein the providing a set of target vectors and generating a series of chromosomes, based on the target vectors, over multiple generations is effected in a Target Objectives Genetic Algorithm (TOGA) process.
10. (Original) The method of claim 1, wherein the method further includes placing targets in the areas of the gaps.
11. (Original) The method of claim 10, wherein the effecting a gap filling process by which the efficient frontier is filled in the area of the gap is performed using a Target Objectives Genetic Algorithm (TOGA) process.
12. (Original) The method of claim 10, wherein once the targets are placed, the method further including generating feasible points around each target using a Target Objective Genetic Algorithm (TOGA) process.

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13. (Original) The method of claim 1, wherein the gap is an area that is sparsely populated by possible solutions.
14. (Original) The method of claim 1, wherein in the gap filling process, the efficient frontier is substantially completed in the area by filling in the efficient frontier with additional solutions.
15. (Original) A system for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the system comprising:
- an efficient frontier generation portion that performs a first multi-objective optimization process, based on competing objectives, to generate an efficient frontier of possible solutions;
  - a visual tool by which a user observes the generated efficient frontier, based on the observing, the user identifying an area of the efficient frontier in which there is a gap; and
  - a gap filling portion, the gap filling portion effecting a gap filling process by which the efficient frontier is supplemented in the area of the gap, the supplemented efficient frontier being used in investment decisioning.
16. (Original) The system of claim 15, wherein the visual tool presents the efficient frontier to the user in a graphical format.
17. (Original) The system of claim 15, wherein the visual tool presents the efficient frontier to the user in a numerical data format.
18. (Original) The system of claim 15, wherein the gap filling process is performed using a Target Objectives Genetic Algorithm (TOGA) process.

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19. (Currently amended) The system of claim 15, wherein ~~further including~~ the selecting at least one portfolio from the generated efficient frontier ~~include~~ ~~by~~ selecting the at least one portfolio in the area that was filled in by the gap filling process.

20. (Original) The system of claim 15, the effecting the gap filling process by which the efficient frontier is filled in the area of the gap further including:

providing a set of target vectors;

generating a series of chromosomes, based on the target vectors, over multiple generations.

21. (Original) The system of claim 20, wherein the system further includes evaluating the fitness of each chromosome until a population with an acceptable fitness is determined so as to fill in the identified gap.

22. (Original) The system of claim 15, where in the gap filling process, the efficient frontier is smoothed out in the area by filling in the efficient frontier with additional solutions.

23. (Original) A computer readable medium for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the computer readable medium comprising:

a first portion that performs a first multi-objective optimization process, based on competing objectives, to generate an efficient frontier of possible solutions;

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a visual tool by which a user observes the generated efficient frontier, based on the observing, the user identifying an area of the efficient frontier in which there is a gap; and

a second portion, the second portion effecting a gap filling process by which the efficient frontier is supplemented in the area of the gap, the supplemented efficient frontier being used in investment decisioning.

24. (Original) A method for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the method comprising:

performing a first multi-objective optimization process, based on competing objectives, to generate an efficient frontier of possible solutions;

observing the generated efficient frontier;

based on the observing, identifying an area of the efficient frontier in which there is a gap;

effecting a gap filling process by which the efficient frontier is supplemented in the area of the gap, the efficient frontier being used in investment decisioning; and

the effecting the gap filling process by which the efficient frontier is filled in the area of the gap further including:

providing a set of target vectors;

generating a series of chromosomes, evaluated on the basis of the target vectors, over multiple generations; and

wherein the method further includes evaluating the fitness of each chromosome until a

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population with an acceptable fitness is determined so as to fill in the identified gap.